

**REMARKS**

This is in response to the Office Action dated February 6, 2008. Claims 4-34 are pending. Claims 4-34 stand rejected in the outstanding Office Action. Claim 4 has been amended.

The objection to the specification regarding the title, as well as the length of the abstract, is respectfully traversed. Both the abstract and the title have been amended to overcome the Examiner's objections.

The rejection of claims 4-34 under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite, is respectfully traversed. The Examiner stated that the limitation "on the order of 0 V" in claim 4 is not clear what it refers to. Claim 4 has been amended so that the above limitation has been changed to "about 0 V", which terminology has been deemed by the courts as being definite, see MPEP 2173.05(b)(A).

The rejection of claim 4 under 35 U.S.C. § 103(a), as allegedly being unpatentable over Kawasaki et al. (US 2003/0047785) in view of Goodman (US 4,204,217) and further in view of Yan et al. (US 2003/0218222), is respectfully traversed.

Amended claim 4 now recites "said nitrogen and hydrogen are *intentionally* added to the active layer and a threshold voltage of the semiconductor device *is restrained* to be about 0 V". Support for the amendment can be found, for example, in p. 62, line 24 to p. 63, line 3 of the instant specification. Kawasaki/Goodman/Yan fails to teach or suggest this feature.

Regarding the limitation "said nitrogen and hydrogen are added to the active layer so that to control a threshold voltage of the semiconductor device to be on the order of 0 V", the Examiner stated that the limitation "specifies an intended use or field of use, and is treated as non-limiting since it has been held that in device claims, intended use must result in a structural

difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art”.

With the above amendment of claim 4, it is made clear that a) nitrogen and hydrogen are intentionally doped to the active layer and b) the limitation of the threshold being about 0 V is a positive limitation and not an intended use. Moreover, in response to the Examiner stating that “applicants do not specifically claim ensuring restrained threshold voltage shift in claim 4”, see section 11 of the Office Action of February 6, 2009, the above amendment specifically recites the restraint of the threshold voltage, not disclosed in any of the cited prior art references.

In the claimed device, the active layer is doped with nitrogen and hydrogen so as to reduce the number of free electrons. Using these elements also causes the Fermi level to decrease to the center of the band gap, thus allowing a decrease in the gate voltage required for removal of the too many electrons, with the result that the threshold voltage becomes on the order of 0 V (p. 63, lines 4-21 in the instant specification).

The claimed device also requires doping with hydrogen to allow “restraint of a TFT property change (threshold voltage shift  $\Delta V_{th}$ ) occurring over time in response to application of a positive voltage, as shown in Fig. 18” (p. 63, lines 22-25 in the instant application). Therefore, the doping of hydrogen in the claimed device must be intentional to ensure that the threshold voltage shift is restrained. It would not be possible to guarantee this with unintentional doping with hydrogen.

It is submitted that this restraint of the threshold voltage is not disclosed in any of the cited references. Goodman discloses a “threshold” for turning the transistor “on” is above zero (i.e., positive voltage - if the voltage drop is zero or less, the display portion is not turned “on”),

see col. 4, lines 56-67 in Goodman. However, Goodman does not consider any form of control for this threshold voltage.

Comparison of Figs. 15 and Fig. 17 of the instant specification shows that controllably doping the active layer with nitrogen and hydrogen causes the threshold voltage to be about 0 V (see Fig. 17) compared to the threshold voltage of an active layer, provided with a protective layer but without added nitrogen and hydrogen, whose threshold voltage is about -40 V (see Fig. 15), see also p. 62, lines 17-24 of the instant specification. Therefore, unintentional doping of the active layer with hydrogen would not produce an active layer with the claimed property of having a threshold voltage of about 0 V. Kawasaki/Goodman/Yan does not teach doping the active layer with hydrogen.

For the above reasons, claim 4 is allowable.

Regarding claim 5, the Examiner cited the new reference of Yamada (US 5,674,599) along with the previously presented references of Kawasaki, Goodman and Yan.

According to the Examiner “Yamada discloses a method for manufacturing a thin film including ZnO (col. 4, lines 1-4), wherein nitrogen monoxide, nitrogen dioxide and hydrogen peroxide can be used as a compound containing oxygen element (col. 10, lines 53-56)”, see section 8, p. 8 of the Office Action.

Yamada discloses a multi-layer thin device, wherein a hard carbon film 2 is formed on a plastic substrate 1 which is coated with an inorganic material (col. 6, lines 3-29). The inorganic material may be ZnO (col. 4, line 4, cited by the Examiner). The hard carbon film may comprise among other things an oxygen element (see col. 9, lines 58-62). Yamada teaches that as the compound containing oxygen element, nitrogen monoxide, nitrogen dioxide or hydrogen peroxide may be used (see col. 10, lines 53-63).

From the above it is clear that the claimed three compounds are used to form the hard carbon film 2, not the ZnO layer (constituting the inorganic material which is coated on the plastic substrate 1 and is under the carbon film 2). Moreover, the inorganic ZnO layer does not constitute an active layer of a semiconductor device, as the claim requires.

For at least the above reasons, claim 5 is patentable over  
Kawasaki/Goodman/Yan/Yamada.

It is respectfully requested that the rejection of claims 5-34, each one dependent from claim 4, also be withdrawn.

In view of the foregoing and other considerations, all claims are deemed in condition for allowance. A formal indication of allowability is earnestly solicited.

The Commissioner is authorized to charge the undersigned's deposit account #14-1140 in whatever amount is necessary for entry of these papers and the continued pendency of the captioned application.

Should the Examiner feel that an interview with the undersigned would facilitate allowance of this application, the Examiner is encouraged to contact the undersigned.

Respectfully submitted,

**NIXON & VANDERHYE P.C.**

By: /Leonidas Boutsikaris/  
Leonidas Boutsikaris  
Reg. No. 61,377

LB:tlm  
901 North Glebe Road, 11th Floor  
Arlington, VA 22203-1808  
Telephone: (703) 816-4000  
Facsimile: (703) 816-4100